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TECHNICAL NOTES
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STN PUB ALASKA FOREST RESEARCH CENTER
U. S. DEPARTMENT OF AGRICULTURE, FOREST SERVICE

No. 4 JUNEAU, ALASKA

Effect of Rainfall on Stream Flow in Southeast Alaska

Waterflow patterns of Southeast Alaska salmon streams are characterized by marked fluctuation in flow and recurring fall floods. A low stage in the dead of winter while precipitation is stored as snow, a considerable spring run-off that is quite stable until the snow is dissipated, and summer and fall flows fluctuating with rainfall seems to be the typical pattern. Extreme low water follows rainless periods in summer. On streams having no lakes to exert a stabilizing influence, the sustained heavy rainfalls of autumn cause violent floods.

First year measurements on 4 streams, taken in a study of the effect of logging on salmon spawning streams, indicate also that in this region of heavy rainfall watersheds remain almost continually saturated. Because of this the watersheds have little extra storage capacity during the seasons of heaviest rainfall, hence fall floods are normal. Total rainfall on the watersheds of streams without sizable lakes drains out within a few hours after it falls.

The watersheds are composed primarily of thin soils over bed rock on steep slopes and water-logged raw peat in the muskegs. Ground storage capacity of water is small. Base flow is a small fraction of the discharge rate accompanying heavy rains. With ground storage capacity quickly exhausted after rains commence, discharge quickly rises to roughly equal the rainfall rate. On Harris River the September 21-22 precipitation of 7.13 inches resulted in a discharge rate equal to the rainfall rate before half the rain had fallen. After two days of diminishing rain followed by two rainless days discharge had decreased from the peak of 4230 second-feet to 140 second-feet. When the small soil water storage capacity is exhausted stream flow is very sensitive and closely correlated to rainfall. Figure 1 and Table 1 clearly show the impact of the 4.98-inch rainfall of October 13 on the saturated watershed of Harris River. Here the preceding 5 days of October 8 to 12 yielded from 1.62 to .22 inches of rain keeping the soil saturated and the stream level above normal and fluctuating rapidly. The October 13 rainfall drove the river's discharge rate to the season's peak of 7360 second-feet. The next day this was down to 715 second-feet falling to 280 on the 15th and 150 second-feet on the 17th of October.

Rainfall in Southeast Alaska is not of the cloudburst type and thunderstorms are uncommon. The heaviest rainfalls of the past year were steady prolonged downpours characteristic of the fall southeastern storms.

Table 1 gives comparative data between rainfall and discharge during the peak salmon spawning period for two of the four streams under observation. The Table 1 values giving greater discharge than total precipitation is probably due to heavier rainfall at higher elevations. Flow patterns for the three streams without lakes are nearly identical. The fall rainy season normally produces the most violent floods at which time movement of log jams and gravel bars and minor changing of stream channels is common. Water erosion is not serious outside of the stream beds although landslides do occur on these forested watersheds when the saturated thin soil over bed rock slides from steep slopes. Such slides are seldom extensive, the most common being a narrow ribbon from near the top of a ridge and ending at the beach or intervening bench.

Table 1.

	Maybeso Creek	Harris River
Length of drainage	6 miles	11 miles
Area of watershed	14.5 sq. miles	30 sq. miles
Minimum discharge	15 cu. ft./sec.	42 cu. ft./sec.
Maximum discharge	3460 " " " "	7360 " " " "
Aver. max. 24 hr. rainfall in cu. ft./sec. 1/	2000 " " " "	4040 " " " "
Aver. max. 48 hr. rainfall " " " " " 2/	1400 " " " "	2900 " " " "
Aver. max. 24 hr. discharge	2032 " " " "	4542 " " " "
Aver. max. 48 hr. discharge	1345 " " " "	2710 " " " "
Ratio minimum to maximum discharge	1/231	1/175

1/ Average of maximum 24 hour period precipitation recorded on October 13, 1949.
2/ Average of maximum 48 hour period precipitation recorded on September 21 and 22, 1949.

April, 1950 L. W. Zach

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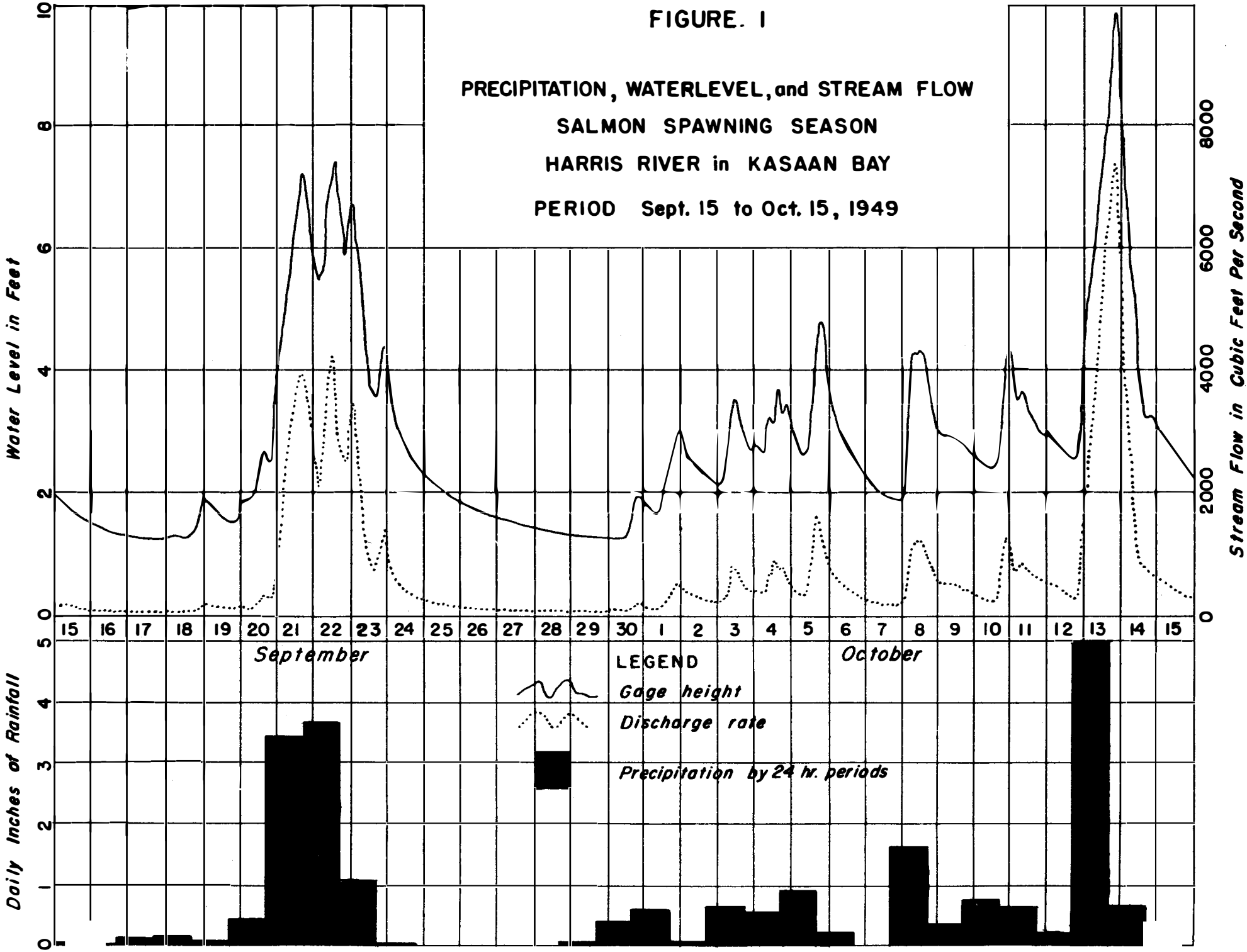
FIGURE. 1

PRECIPITATION, WATERLEVEL, and STREAM FLOW
SALMON SPAWNING SEASON
HARRIS RIVER in KASAAN BAY
PERIOD Sept. 15 to Oct. 15, 1949



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